We claim:

1. A process for producing dimethyl ether comprising:
reacting syngas in contact with a hybrid catalyst in a microchannel reactor at a temperature from about 200° C. to about 400° C. with a contact time of from about 25 milliseconds to less than about 1 second; and converting more than about 60% of CO in the syngas to dimethyl ether and methanol.

2. The process of claim 1 comprising converting more than about 60% of CO in the syngas to dimethyl ether.

3. The process of claim 1, wherein there is no liquid holdup inside the microchannel reactor.

4. The process of claim 1, wherein the hybrid catalyst comprises a methanol synthesis catalyst and a methanol dehydration catalyst present in a weight ratio of about 1:1.

5. The process of claim 1, wherein the hybrid catalyst comprises a methanol synthesis catalyst and a zeolite catalyst present in a weight ratio of about 1:1 to about 2:1.

6. The process of claim 1, wherein the hybrid catalyst comprises F51-8PPT and ZSM-5 zeolite with a Si/Al ratio of about 30.

7. The process of claim 6, wherein the F51-8PPT and ZSM-5 zeolite are present in a weight ratio of about 1:1.

8. The process of claim 1, wherein the process is carried out in multiple microchannel reactors to produce greater than about 70% CO conversion to dimethyl ether and methanol.

9. The process of claim 1, wherein the process is carried out in multiple microchannel reactors to produce from about 80% CO conversion to about 88% CO conversion to dimethyl ether and methanol.

10. The process of claim 1, wherein the process is carried out at a temperature of from about 240° C. to about 290° C. with a contact time of less than about 500 milliseconds.

11. The process of claim 1, wherein the source of syngas is biomass.

12. A method of making DME, comprising: passing syngas in contact with a hybrid catalyst comprising a methanol synthesis catalyst and a dehydration catalyst in a microchannel reactor at a temperature of from about 240° C. to about 290° C. with a contact time of less than about 1 second and at a pressure in the range of about 0.5 MPa to about 8 MPa; and
producing greater than about 70% CO conversion to DME and methanol.

13. The process of claim 12, wherein the methanol synthesis and dehydration catalyst comprises a methanol synthesis catalyst and a zeolite catalyst that have been mixed together.

14. The process of claim 12, wherein the methanol synthesis and dehydration catalyst comprises a copper or palladium based methanol synthesis catalyst and a zeolite catalyst having a Si/Al ratio of about 30.

15. The process of claim 12, wherein the methanol synthesis and dehydration catalyst are present in a weight ratio of about 1:1 to about 2:1.

16. The process of claim 12, wherein the methanol synthesis and dehydration catalyst comprise a copper-based methanol synthesis catalyst and a zeolite catalyst present in a weight ratio of about 2:1 to about 1:1.

17. The process of claim 12, wherein the contact time is less than about 500 milliseconds and the pressure is from about 2 to about 8 MPa.

18. The process of claim 12, wherein the source of syngas is biomass.

19. A method of producing dimethyl ether, comprising:
providing a syngas source;
combining the syngas source with a hybrid catalyst comprising a methanol synthesis catalyst and a methanol dehydration catalyst; and
reacting the syngas in the presence of the catalyst in a microchannel reactor under substantially isothermal conditions at a temperature of from about 200° C. to about 350° C. with a contact time of from about 25 milliseconds to about 500 milliseconds to produce DME with greater than about 60% CO conversion to dimethyl ether and methanol.

20. A method of producing dimethyl ether, comprising:
providing a biomass syngas source;
combining the biomass syngas source with a methanol synthesis catalyst and dehydration catalyst, in a microchannel reactor, each microchannel at a single temperature of from about 200° C. to about 350° C. and with a contact time of less than about 1 second; and
producing greater than about 60% CO conversion to dimethyl ether and methanol.

21. A method of producing dimethyl ether, comprising:
providing a biomass syngas source;
combining the biomass syngas source with a methanol synthesis catalyst and zeolite catalyst present in a weight ratio of about 1:1; and reacting the biomass syngas in the presence of the catalyst in a microchannel reactor, at a temperature of from about 240° C. to about 290° C., the temperature varying less than about 2° C. while the biomass syngas is reacting in the microchannel reactor, and with a contact time of less than about 500 milliseconds; and
producing greater than about 60% CO conversion to dimethyl ether and methanol.

22. The process of claim 1 further comprising:
providing the syngas and the bydrid catalyst to a module including a plurality of microchannel reactors; and
reacting the syngas and the hybrid catalyst in the microchannel reactors at temperatures of from about 200° C. to about 350° C. and with a contact time of less than about 1 second to obtain greater than about 70% CO conversion to dimethyl ether and methanol.

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